



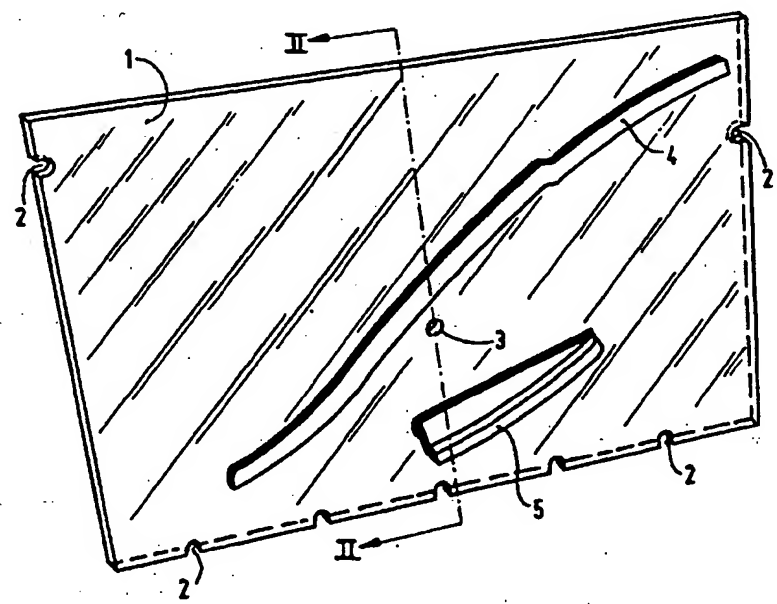
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(54) Title: A MUSICAL INSTRUMENT PROVIDED WITH A SOUND BOARD



(57) Abstract

A musical instrument, in particular a stringed instrument, for example a piano, provided with a sound board (1) for converting vibrations generated in the musical instrument into audible sound, whereby the sound board substantially consists of glass or a similar homogeneous material, preferably hardened glass. The sound board may be fastened with glue in the instrument and possibly be provided with a bridge (4, 5) fastened glued thereon, across which the strings extend.

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## 5 A MUSICAL INSTRUMENT PROVIDED WITH A SOUND BOARD

The invention relates to a musical instrument, in particular a stringed instrument, provided with a sound board for converting the vibrations generated in the musical instrument into audible sound. Although the invention may be used with a great many kinds of musical instruments, the invention will be described more particularly as used with a piano.

15 A vibration which is generated in a musical instrument can be converted into audible sound by means of a sound board, as happens in particular with a piano. The sound board is to that end provided with a so-called bridge, against which the strings of the piano are guided. The vibration of the string is transmitted to the sound board via the said bridge, and by properly selecting the materials and shape for the sound board readily audible sound is obtained, and that for every pitch and volume and combinations thereof. Because the sound board is responsible for the sound quality of the instrument, it is a highly critical part of the musical instrument.

For many years sound boards have been made of wood, more particularly specially resonating spruce wood. The quality of the sound board is further improved by providing wooden strips, ribs or spreaders at the rear side. Said strips are glued on in regularly spaced-apart relationship, in such a manner that the grain of said strips extends at a right angle to the grain of the wood of the sound board. In this way the strips assist in evenly dispersing the resonance in all directions. In addition the strips function to reinforce the sound board. In order to ensure an adequate transmission of the vibration via the bridge to the sound

board, the strings exert a large force on the bridge, which force is transmitted to the sound board. The wooden strips which are glued on to the sound board provide the sound board with sufficient resistance to withstand the force exerted by the strings. It is usual thereby to make the sound board slightly curved. In order to keep the sound board of a piano in good condition, it is necessary to keep both the temperature and the humidity level in the piano within certain limits. In addition to that the tuning of a piano is dependent on the surrounding atmosphere. A piano tuned in summer will be out of tune in winter. Another drawback of the conventional sound board is that there will always be differences in the material of the sound board (special types of wood), because the circumstances under which the wood grows cannot be completely controlled. Two sound boards that have been manufactured in exactly the same manner will always exhibit differences between themselves, therefore, which may be expressed in the resonance of the sound board. Additionally the wood from which the sound board has been made will exhibit some ageing, which will in time lead to a change in its characteristics.

The object of the invention is to provide a musical instrument comprising a sound board having characteristics which are completely predictable and which will remain unchanged in the course of time, whereby said characteristics are not dependent on thermal or other atmospheric conditions.

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In order to accomplish this objective the musical instrument is according to the invention provided with a sound board which substantially consists of glass or a similar homogeneous material. Preferably the sound board substantially consists of hardened glass. The glass may be reinforced with metal wires. Furthermore the glass may be of a laminated type.

Against all expectations and contrary to prevailing views it has become apparent that in practice it is possible to produce a sound board of excellent quality, which

5 substantially consists of glass. A piano having an excellent sound quality may be obtained by utilizing a hardened flat sheet of glass, for example having a thickness of about 10 mm, as the sound board. Even without

10 strips of material on the sound board or using a curved sheet of glass, a result can be obtained which satisfies high standards.

A conventional piano must be tuned several times after

15 having been strung, and after that regular tuning is necessary, dependent on its use and the atmospheric conditions. It has become apparent that when hardened glass is utilized the number of times that tuning is necessary can be reduced considerably.

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According to another aspect of the invention the sound board can be attached in the musical instrument by means of a glue that will remain elastic, such as silicone adhesive. The degree of elasticity may thereby be influenced by the

25 thickness of the film of glue stock. The sound board may consist of a substantially rectangular sheet of glass, which is attached in the musical instrument along its edges, the sheet of glass may also be glued on to the musical instrument in other places and of course it is also

30 possible to use other forms besides a rectangle, for example when the sound board is used in a grand piano.

According to another aspect of the invention the bridge for transmitting the vibrations to the sound board is glued on

35 to the sound board by means of a glue that will remain elastic. The bridge may be made of wood or a homogeneous material, such as glass. Also in this case the glue may be

silicone adhesive, which is preferably used in a very thin film.

The place where the bridge in a piano is connected with the  
5 sound board may not be the same as the place where the  
string is in contact with the bridge, which applies in  
particular to the strings for the lower tones. Such bridge  
will be referred to as special bridge. In that case the  
vibration caused by the string is transmitted parallel to  
10 the sound board over some distance by the special bridge.  
In order to prevent undesirable forces between the special  
bridge and the sound board thereby, the special bridge  
rests on the sound board, with the interposition of a  
supporting element, according to another aspect of the  
15 invention, and that at some distance from the place where  
the special bridge is glued on to the sound board. The  
supporting element is adjustable for length, as a result of  
which the supporting force may be adjusted. The supporting  
element may thereby comprise a vibration-absorbing  
20 material, for example a slice of cork which abuts against  
the glass, so that the transmission of sound vibrations is  
reduced.

Apart from that it has become apparent that with a sound  
25 board of glass the place where the vibration is transmitted  
~~to the sound board is less critical than with a sound board~~  
of wood. This results in a greater freedom in selecting the  
location of the bridge on the sound board, which even makes  
it possible to refrain from using a special bridge.

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As already said before the sound board may be made of a  
flat sheet of glass, it is also possible, however, to use  
any other shape, for example a curved sheet of glass, as  
the basis for the sound board, which may take the form of a  
35 resonance box in that case. A great many shapes can be  
readily realized when using glass.

Apart from the technical effect the use of a transparent or partially transparent glass sound board also has an aesthetic effect, which gives a piano fitted with such a sound board a very attractive appearance. The use of a glass sound board has made it possible to make the piano at least partially transparent, as a result of which the player of the instrument becomes more visible, whilst also the player himself will get a more extensive view.

- Special effects may be obtained thereby, by using a coloured material for the sound board, whether or not in combination with a special illumination thereof. The outward appearance of the piano may be further adapted as desired by means of a nontransparent or semi-transparent coating, which for example results in a black or reflecting surface.

By using a homogeneous material it is very well possible to influence the characteristics of the sound board in a predictable manner, for instance by providing recesses in the sound board. Said recesses may be shaped as circular holes. The recesses may also be located at the edge of the sound board. In connection with the construction of the instrument and in particular in connection with the attachment of the frame within which the strings are tightened. special fastening elements of heavy construction may be present inside the musical instrument. It may be necessary thereby for said fastening elements to be provided at the location of the sound board. The use of a homogeneous material has made it possible to provide a recess at any desired place of the sound board, which recess is dimensioned sufficiently large for the connecting element to extend through said recess without coming into contact with the sound board.

Further aspects of the sound board according to the invention will be explained or referred to in the

description of the Figures and/or in the claims.

In order to more fully explain the invention a description of an embodiment of a sound board for a piano will be given with reference to the drawing. A vertical piano has been chosen for this purpose, although the invention may correspondingly be used with a piano having horizontal strings, generally referred to as a grand piano.

10 Figure 1 is a perspective view of the sound board;

Figure 2 is a sectional view along the line II - II in Figure 1;

15 Figure 3 shows a detail of Figure 2;

Figure 4 is a perspective view of a sound board, together with a frame for a piano; and

20 Figure 5 is a sectional view of the attachment of a frame and a sound board in the frame of a piano.

The Figures illustrate the embodiment merely diagrammatically. Like parts are numbered alike in the

25 various Figures.

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Figure 1 shows a sound board for a piano, which sound board substantially consists of a flat sheet of glass 1 having a thickness of for example 10 mm. The sheet of glass may be  
30 glued on to the frame of a piano, for example along the entire edge of the sheet of glass. The sheet of glass 1 is at its edge provided with recesses 2 and, spaced from the edge by some distance, with a recess in the shape of a hole 3, which recesses function to attach the frame within which  
35 the strings are tightened. This will be explained in more detail hereafter.



The sound board, which substantially consists of a sheet of glass 1, is furthermore provided with a bridge 4 and a special bridge 5, which are able to support the strings of the piano in such a manner that the vibrations of the strings can be transmitted to the sheet of glass 1. The bridges 4, 5 may be made of wood or of a different material, a homogeneous material, for example, such as glass. The bridges are glued on to the sheet of glass 1, with a thin film of silicone adhesive, for example, indicated at 6 in Figures 2 and 3.

From Figure 2 it appears that the bridge 4 has a substantially rectangular cross-section. The cross-section of the bridge 5, which is illustrated on a larger scale in Figure 3, is such that the place where the bridge 5 is attached to the sheet of glass 1 (film of adhesive 6), is not the same as the place where the strings are in contact with the bridge. The purpose of a bridge 5 of this type is to shift the vibrations of the strings over some distance before they are led to the sound board. As is shown in Figure 3 the bridge 5 is supported by a metal supporting element 8, which abuts against the sheet of glass 1 with the interposition of a slice of cork 9. The supporting element 8 consists of two parts, which may be screwed together, so that the length of the supporting element is adjustable. By utilizing a damping material, such as cork, it is prevented that the vibrations are transmitted to the sheet of glass via the supporting element 8.

Figure 4 shows a perspective view of a frame of a piano, together with the sheet of glass 1 and the bridges 4, 5 provided thereon. The frame 10 is made of cast iron and is of very heavy construction, because the strings 11 are tightened within the frame 10 with great force. The embodiment concerns an overstrung piano, that is the strings for the low tones are strung crossways over the strings for the high tones. The strings for the higher

tones are in contact with bridge 4, whilst the strings for the lower tones run over bridge 5. The strings thereby exert a force on the bridge which is perpendicular to the sheet of glass 1.

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Figure 4 only shows part of the total number of strings, whilst moreover the means for tightening the strings, which are located at the upper sides of the strings, are not shown.

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Figure 4 shows the screwed bolts 12, 13 with which the frame is secured to the frame of the piano. The screws 12 extend through the recesses 2 at the edge of the sheet of glass and the bolt 13 extends through the circular recess 3 in the sheet of glass. The recesses 2, 3 in the sheet of glass are sufficiently large to prevent any contact between the sheet of glass and the fastening means of the frame.

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Figure 5 illustrates in more detail the attachment of the frame to the frame of the piano, whereby it can be seen clearly that the sheet of glass 1 does not come into contact with the frame 10. Screws 12 extend along the edge of the sheet of glass 1, whereby the screw 12 is surrounded by a spacer sleeve 14, on which the frame rests. A metal ring 17 is provided between the spacer sleeve 14 and the wooden beam 16 of the frame of the piano, to prevent damaging of the wood of the beam 16 by the spacer sleeve 14 when screw 12 is tightened. The sheet of glass 1 is attached to the wooden beam 16 of the frame of the piano by means of a film of adhesive 15, for example consisting of silicone adhesive.

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Bolt 13 extends through recess 3 in the sheet of glass and is likewise provided with a spacer sleeve 14, on which the frame 10 rests. The parts of the frame of the piano shown in Figure 5 consist of a vertical beam 16, which is located at the rear side of the piano, and a metal supporting beam

35

18 with a tapped hole 18, in which bolt 13 is screwed.

Figure 4 shows a frame 10 which is usual for common pianos. Because the glass sound board makes it possible to make a  
5 piano transparent, at least partially so, the frame may thereby be adapted in such a manner, that it occupies less surface area, as a result of which it interferes less with the transparency of the piano.

10 The embodiment described is merely to be considered as an example, it will be apparent that the invention may be used in a corresponding manner with a great many other musical instruments. It is possible thereby to use a flat sheet of glass, a curved sheet of glass or any other shape of the  
15 glass, such as a entirely or partially closes resonance box.

## CLAIMS

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1. A musical instrument, in particular a stringed instrument, provided with a sound board for converting the vibrations generated in the musical instrument into audible sound, characterized in that said sound board  
10 substantially consists of glass or of a similar homogeneous material.

2. A musical instrument according to claim 1, characterized in that said sound board substantially  
15 consists of hardened glass.

3. A musical instrument according to claim 1 or 2, characterized in that said sound board is attached in said musical instrument by means of a glue that will  
20 remain elastic.

4. A musical instrument according to any one of the preceding claims, characterized in that a bridge for transmitting the vibrations to the sound board is  
25 attached to said sound board by means of a glue that will remain elastic.

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5. A musical instrument according to claim 3 or 4, characterized in that said glue is a material on the  
30 basis of silicone.

6. A musical instrument according to claim 4, characterized in that said bridge for transmitting the vibrations to the sound board is supported on said  
35 sound board at some distance from the place where the bridge is attached to the sound board, with the interposition of a supporting element.

7. A musical instrument according to claim 6,  
characterized in that said supporting member comprises  
a vibration-absorbing material, for example a slice of  
cork, and/or that the length of the supporting means is  
adjustable.
8. A musical instrument according to any one of the  
preceding claims, characterized in that said sound  
board is made of a substantially flat sheet of glass,  
which is slightly curved under lateral pressure.
9. A musical instrument according to any one of the  
preceding claims, characterized in that said sound  
board is made of a curved sheet of glass.
10. A musical instrument according to any one of the  
preceding claims, characterized in that said sound  
board is substantially or partially transparent.
11. A musical instrument according to claim 10,  
characterized in that said sound board is coloured.
12. A musical instrument according to claim 10 or 11,  
characterized in that said sound board is at least  
partially provided with a nontransparent or semi-  
transparent coating.
13. A musical instrument according to any one of the  
preceding claims, characterized in that said sound  
board is provided with recesses, for example in the  
shape of circular holes or semi-circular recesses at  
the edge of the sound board.
14. A musical instrument according to claim 13,  
characterized in that fastening means extend through  
said recesses for interconnecting the parts of the  
musical instrument, whereby the recesses are such that

the sound board cannot come into contact with the fastening means.

- 5 15. A musical instrument according to any one of the preceding claims, characterized in that said sound board substantially consists of reinforced glass and/or glass of a laminate type.
- 10 16. A sound board for a musical instrument, said sound board substantially consisting of glass or a similar homogeneous material.
- 15 17. A sound board for a musical instrument according to any one of the claims 1 - 15.
18. A sheet of glass to be used as a sound board according to any one of the preceding claims.
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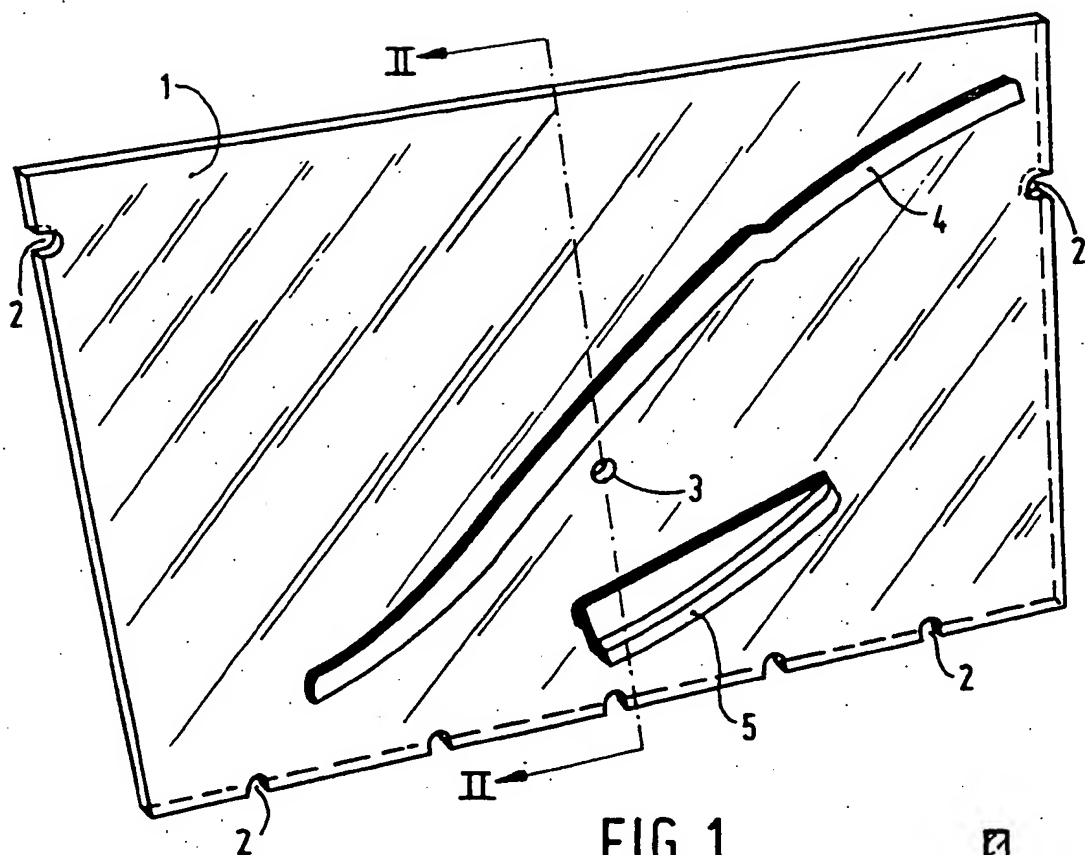


FIG. 1

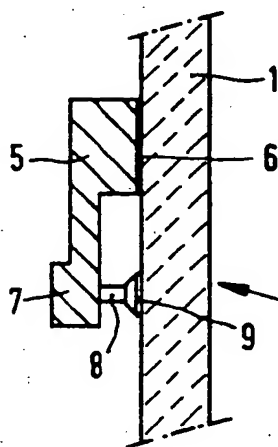


FIG. 3

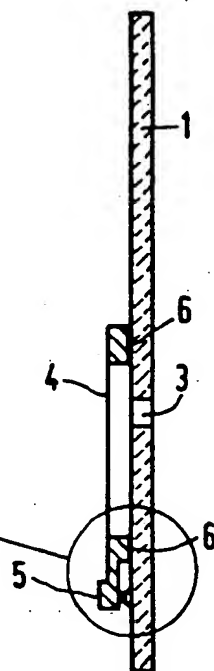


FIG. 2

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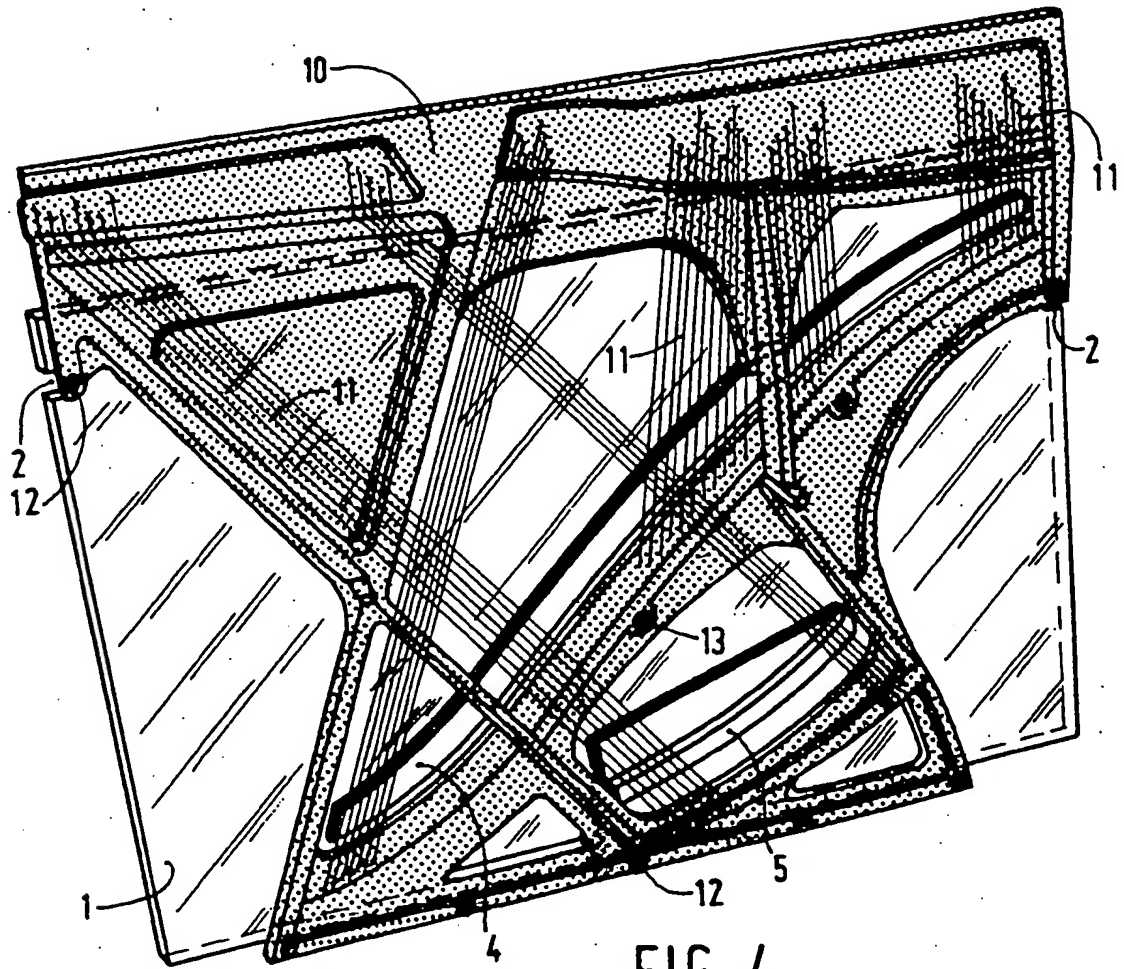


FIG. 4

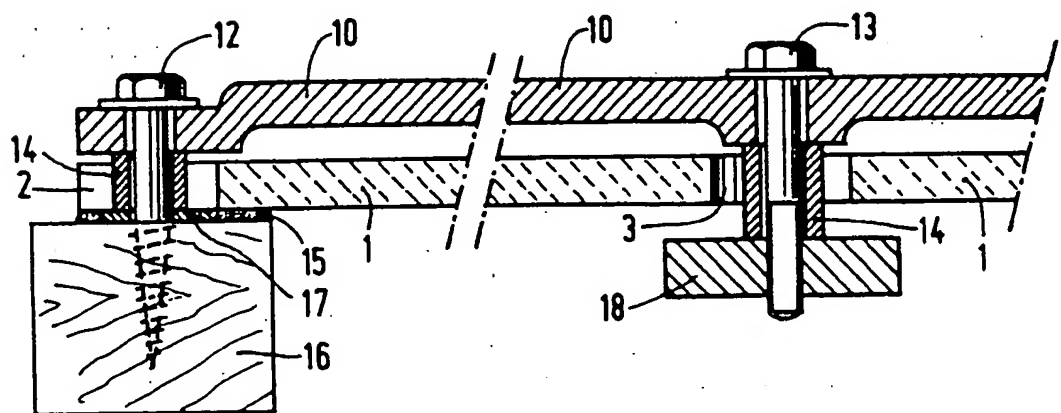


FIG. 5



## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 95/00371

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 G10C3/06 G10D1/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G10C G10D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,A,31 41 237 (W. FRANIA) 11 May 1983 see claims 1,2,6 see page 4, line 34 - page 5, line 10	1,9-12, 16-18
Y	---	2-4,8, 15-18
Y	US,A,3 969 970 (H.R. SWIFT ET AL.) 20 July 1976 see column 2, line 12 - line 26	2,15-18
Y	US,A,4 280 389 (G.S. KLAIBER) 28 July 1981 see column 2, line 50 - line 62	3,4,8
A	US,A,3 724 312 (T. YAMADA) 3 April 1973 see column 2, line 37 - line 53 see column 4, line 51 - line 57 ---	6,7,9, 13,14
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Date of the actual completion of the international search

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International Application No

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,3 427 915 (M. MOONEY ET AL.) 18 February 1969 ---	
A	FR,A,1 235 571 (P.-G. GROSSIN) 30 May 1960 -----	

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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FR-A-1235571	04-11-60	NONE	

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